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BIRD MIGRATION AT MOLE NATIONAL PARK, GHANA

by P. W. Greig-Smith

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INTRODUCTION

Much attention has been given to bird migration in West Africa, both of Ethiopian species (Elgood, Fry & Dowsett 1973) and those of Palaearctic origin (Elgood, Sharland & Ward 1966; Moreau 1972). These discussions have been based largely on comparison of records from many localities; the complementary approach - monitoring the occurrence of birds at a single site over the whole year - has been adopted only rarely (e.g. Morel & Morel 1974, for the Sahel zone in Senegal).

Such an approach is possible for the birds of the Guinea savanna zone in Ghana, as a result of a long-term programme of censuses being carried out by the staff of Mole National Park. This paper describes the seasonal changes in abundance and frequency of Ethiopian species as revealed by these censuses, for the year December 1974 to November 1975. This period has been chosen because for more than four months, more intensive observations were made by the author, and by R. B. Payne and C.J. Risley. This has allowed a check to be made on the validity of the censuses, and has provided data on the occurrence of Palaearctic species, which were largely ignored in the censuses. I have also attempted to relate the timing of migration with rainfall at Mole.

METHODS

Prolonged observations were made almost daily from 3 July to 3 September and from 28 October to 3 December by the author, and from 2 to 26 October by R. B. Payne & C. J. Risley. Records were kept of the dates of sightings and the numbers of all Palaearctic birds, and of many Ethiopian species. In the course of other studies many birds were mist-netted and weighed, allowing confirmation of several otherwise uncertain sight identifications.

The programme of censuses by the Park staff involves counts along three fixed routes, of 2.4, 3.2, and 4.0 kilometres. On up to five mornings each week (totalling between 7 and 19 days per month in the year considered), these routes were followed simultaneously by observers who tallied all the birds seen and heard, and recorded their position along the route. Unfortunately, no censuses were undertaken during March and April 1975.

The data resulting from these censuses are unreliable in some respects, for several reasons. Firstly, several obvious misidentifications were made, and superficially similar congeneric species were not consistently distinguished. Secondly, Cisticola warblers and Euplectes bishop-birds in eclipse plumage were ignored owing to difficulty of identification. Thirdly, the efficiency of the many observers at detecting birds varied considerably. I assessed efficiency both by accompanying the observers during censuses, and by following the route immediately before or after them, making an independent count. Their efficiency in detection in July and August was less than 75% of my duplicate counts, but after the introduction of new observers in October it was 100%. Allowances for these limitations have been made in the analysis, so that they do not affect the validity of the interpretation.

The censuses, and most of the other observations, were made in the vicinity of the Park headquarters at Samole (09° 16'N, 01° 51'W). The birds of this area have been described (Greig-Smith 1976), and are typical of the Guinea savanna zone. The three census-routes pass through wooded savanna along most of their lengths, but one route fringes a marsh, while another includes a short stretch of riverine woodland, thus including many species which would not be recorded in the savanna. The pattern of annual rainfall has been taken from measurements made by the Ghana Meteorological Department at Damongo, c. 24 kilometres from Samole.

PALAEARCTIC SPECIES

Figure 1 indicates the dates on which Palaearctic migrants were recorded at Mole between 2 October and 3 December 1975. In a few cases in which a species was recorded very regularly, it has been marked as present throughout, even though it may not have been noticed on every day. Several of the species listed, and three not included in the figure, may not have been represented by birds from the Palaearctic, as they have Ethiopian sub-species which are not easily distinguishable in the field (the cuckoo Cuculus canorus, and the swallows Hirundo rustica and H. daurica), or have continuous distributions extending into West Africa (the herons Ardeola ralloides, A. ibis, Ardea cinerea, A. purpurea, and Ixobrychus minutus). Two species of this latter group were seen at Mole earlier in the year - A. cinerea on 2 September, and A. purpurea on 22 August - both were probably African birds. Ardeola ibis is considered along with the entirely Ethiopian species, as it was included in the census programme. The few I. minutus that were resident at Samole in the wet season were not augmented by immigrant birds at least up to early December. Hirundo daurica appeared in considerable numbers between 22 and 28 August, dates which suggest that they may have been of Palaearctic origin. Tringa hypoleucos, though Palaearctic, is known to remain in West Africa in small numbers throughout the year, accounting for the single birds recorded at Mole on 29 July, 3 August, and 22 August.

In addition to the 27 species in Figure 1, a further 16 species from the Palaearctic (or having indistinguishable Palaearctic and Ethiopian races) have been recorded at Mole by recent observers. These are listed in Appendix I, along with the months in which they were seen.

In Figure 1, all Phylloscopus warblers have been placed together, even though more than one species may have been seen. All four birds netted were P. trochilus, but we thought that some in the field might have been P. collybita.

Most Palaearctic migrants occurred in very small numbers. During November, when most of the Palaearctic birds were seen, only four species were represented by more than a dozen birds in the area covered. These were the House Martin Delichon urbica, which periodically appeared in flocks of many hundred birds, the Pied Flycatcher Ficedula hypoleuca, of which several dozen were recorded, and the herons Ardeola ralloides and Ardea purpurea, of which the several dozen records may or may not be of the same individuals (no more than four of either species were seen together). In October, only one species was abundant - the Sand Martin Riparia riparia, a flock of more than 200 birds (R. B. Payne, pers. comm.).

The Palaearctic migrants occupied a limited range of the habitats available at Mole. All the water birds occurred at two reservoirs or in the marsh between them, although Ardeola ibis was also seen on areas of short grass surrounding the camps. Several other species were seen only in the long grass fringing the marsh, or in adjacent Acacia scrub; Streptopelia turtur, Jynx torquilla, Acrocephalus scirpaceus, Sylvia communis. Motacilla flava and Cuculus canorus were in gardens in the camp, while the aerial foragers (swift, swallows, martins, bee-eater) appeared to prefer the vicinity of the camp and the marsh. Thus the only species which were seen in the two predominant habitats of the Park were Anthus trivialis, Hippolais polyglotta, Sylvia borin, and Phylloscopus trochilus (in Guinea savanna), and Ficedula hypoleuca (Guinea savanna, riverine forest, and most other habitats).

It appeared that P. trochilus and F. hypoleuca were the only species that were certainly overwintering at Mole. They not only occurred throughout the period covered, but F. hypoleuca, at least, was evidently holding territories in November - one bird was trapped four times in a small area of riverine forest, while another was consistently seen in a group of Acacia trees. Both species were seen to join mixed-species flocks with resident Ethiopian birds.

All the other species were presumably on passage, although some of the water birds may have been deterred from remaining in the area by disturbance around the reservoirs, which is partly responsible for the erratic occurrence of water-birds at all times of year. The records of Streptopelia turtur and Sylvia communis are of interest, as they appear to be further south than the habitual wintering ranges of the species (Moreau 1972).

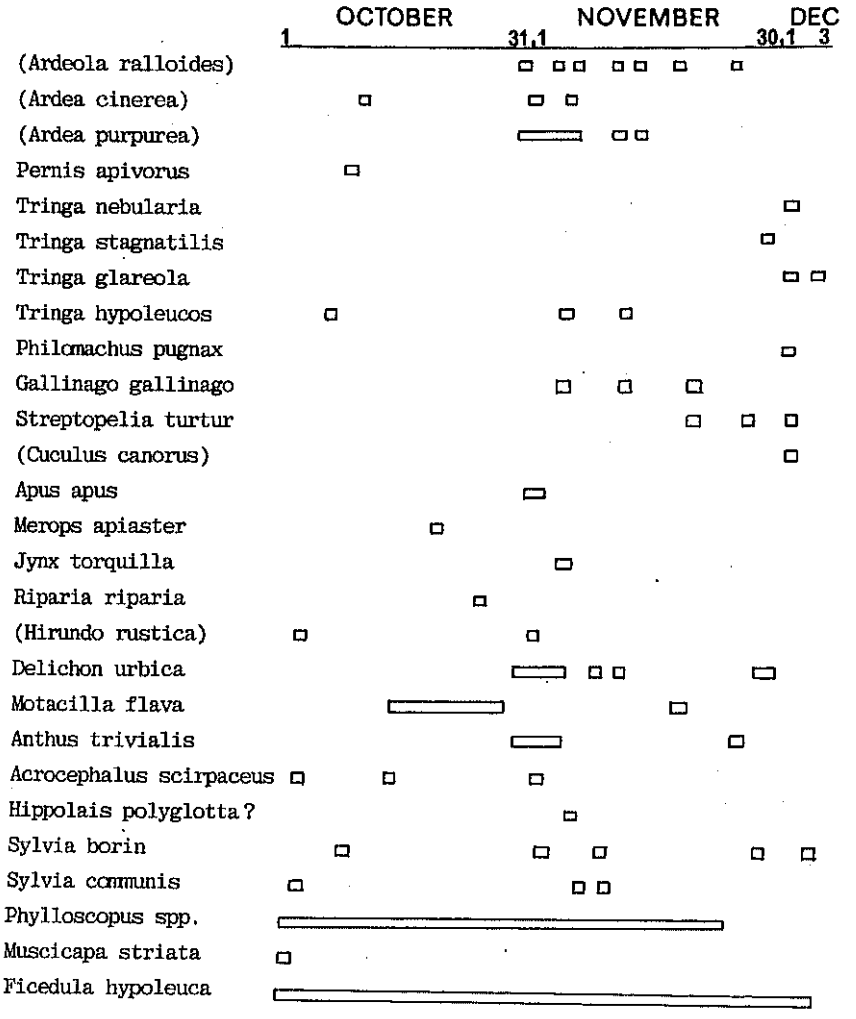

Figure 1. Dates on which Palaearctic migrants were observed in Autumn 1975 at Mole National Park

Species in parenthesis have indistinguishable Ethiopian and Palaearctic races

ETHIOPIAN SPECIES

If doubtful identifications are excluded, and pairs of species which may have been confused are considered together, the total number of species recorded in the censuses was 135, out of a total species-list of 314 (Greig-Smith 1976). Only 80 of these were recorded sufficiently frequently to allow a seasonal analysis. These are listed in Appendix 2, along with two monthly indices derived from the census results : (i) the number of censuses in which the species was recorded; (ii) the total number of individuals of the species that were recorded. Both measures have been adjusted to allow for the variation in the number of census-days each month : thus the numbers given are the values per 30 censuses (i.e. per ten days on which all three routes were followed).

Interpretation must be made with care, as the number of birds recorded reflects not only the immigration and emigration with which we are concerned, but also annual recruitment and mortality, seasonal changes in the habits of the species, changes in visibility due to vegetation growth or grass burning, and variation in the efficiency of the observers. However, the analysis can be cautiously interpreted as showing six patterns of seasonal fluctuations, examples of which are given in Figure 2 :

(A) Resident species, showing no obvious change in abundance or frequency of occurrence;

(B) Wholly migrant species, present at Mole in the dry season;

(C) Wholly migrant species, present in the wet season;

(D) Partial migrant species, augmenting resident populations during the dry season;

(E) Partial migrant species, augmenting resident populations in the wet season;

(F) Passage migrants, which were recorded only at the start and end of the dry season, and most of which were much more abundant in one passage than in the other.

Out of the 80 species considered, 44 are apparently resident, while the various migrant categories contain between 2 (Category C) and 12 species (Category E). This is not necessarily an accurate reflection of the relative numbers of species in each category in the whole avifauna, as only the most abundant species are considered here.

Elgood, Fry & Dowsett (1973) described migration patterns on the basis of records from the whole of Nigeria. The patterns deduced here

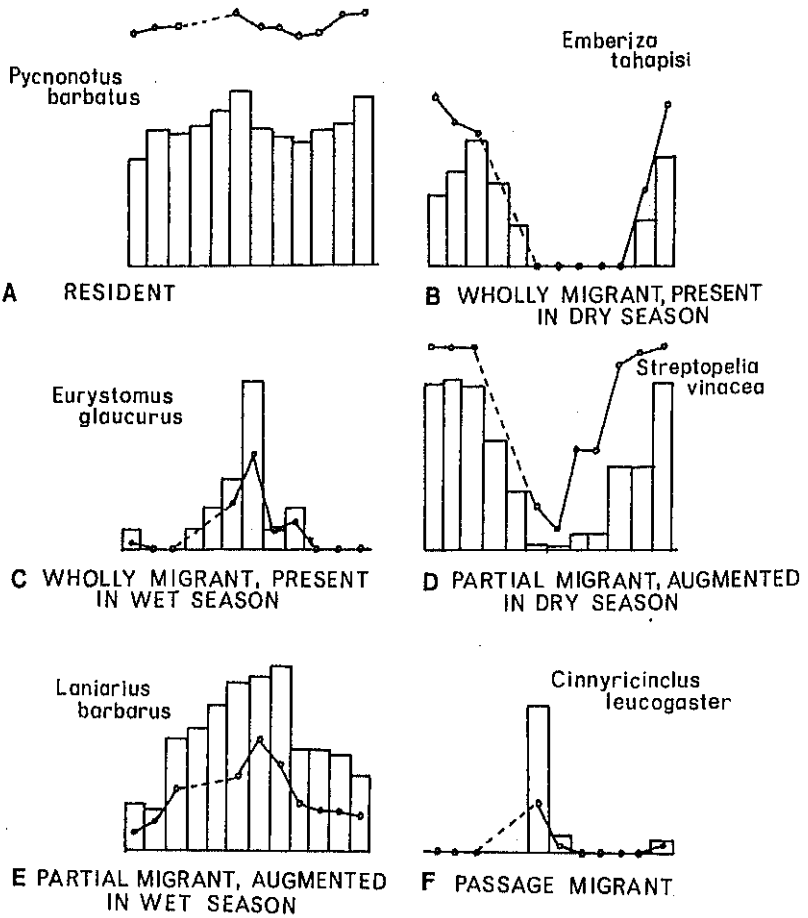

Figure 2. Patterns of migration shown by the birds of Mole National Park

Horizontal axis is months of the year, from December to November. Histograms represent the number of birds, and circles the number of censuses in which the species was seen, out of 30 censuses per month.

Intermediate values have been inserted for March and April as no censuses were carried out, and the November value is 75% of its level in Appendix 2, to allow for the high efficiency of the observers (see text).

are not directly equivalent to their classification, but some general comparisons are possible. Species occurring at Mole only, or most abundantly, in the dry season, (Categories B and D), correspond to the "northern concertina" species of Elgood et al.. Similarly, the species that are most abundant in the wet season (Categories C and E), are equivalent to their "southern concertina" pattern, or in a few cases, to the "hump-backed bridge" pattern. Several of the residents (Category A) show possible indications of an increase in numbers at both ends of the dry season, which would place them as "southern concertina" or "hump-backed bridge" species. Finally, the passage migrants, (Category F) must have discrete breeding and wintering ranges.

In most cases, the Mole results indicate migration behaviour which conforms to the overall patterns described by Elgood et al. (1973). However, the results for the following species appear to be a useful addition to existing knowledge :

Vinaceous Dove Streptopelia vinacea Elgood et al. comment that there is inconclusive evidence for its migration in Nigeria. The present results (Figure 2) suggest a very clear dry season immigration at Mole.

Flappet Lark Mirafra rufocinnamomea Not considered by Elgood et al. to be a migrant. There appears to be an increase in numbers in the wet season, which may, however, merely reflect a higher frequency of display flights (which are normally the first, or only, indication of the species' presence) in the breeding season.

Blue Flycatcher Trochocerus longicauda The results indicate total absence in the late dry season, and a build-up to large numbers at the end of the rains. The species is confined to riverine forest in the Guinea savanna zone, and has not previously been considered to migrate. It is possible that the apparent fluctuation represents a movement into the deeper, less dry, forest, and thus out of range of the census observers, in the dry season.

Gonolek Laniarius barbarus Although there is no previous evidence for migration, there appears to be a considerable wet season increase in numbers (Figure 2), suggestive of partial migration.

Pied Crow Corvus albus All records are from the latter half of the dry season, in considerable numbers. This supports previous opinions that it is migratory, and perhaps suggests that it moves further north than Mole to breed in the rains, remaining there until the mid dry season.

Glossy Starlings Lamprotornis spp. The two species occurring at Mole, L. purpureus and L. chalybeus, were not distinguished in the censuses, although there is clearly a dry season influx of one or more species. Only L. purpureus was present in July/August, in very small numbers,

while L. chalybeus was recorded in addition in October and November (R. B. Payne, pers. comm., and pers. obs.). Neither species is described as migratory by Elgood et al.

Grey-Headed Sparrow Passer griseus Elgood et al. do not consider it to be a migrant, but there is a clear indication of a dry season immigration at Mole. The species has an habitual association with human settlements, which has probably confused evidence of its distribution, and obscured migration in areas which are more densely inhabited than Mole.

Figure 3 indicates the annual cycle of rainfall in the Mole area, and the variation in the total number of birds recorded per month, measured by the mean number of birds seen on all three census-routes per census-day. Also shown is the total number of species seen each month. This has not been adjusted to allow for the number of censuses carried out, because the procedure would involve using only a small part of the information collected. Therefore, since the number of species seen depends on the number of censuses carried out, it should be noted that the actual variation in number of species is less than appears from Figure 3. (However, the form of the species curve is similar to that for individuals, showing that it is not merely an artefact.)

It is evident that bird numbers are greatest at the start, and at the end, of the dry season. The low numbers in the mid dry season must be at least partly due to the inhospitability of the savanna habitats then, causing birds to move into riverine woodland; while in the wet season, the growth of vegetation impairs visibility . Although such factors are involved, the pattern suggests that much of the seasonal variation is attributable to passage migration coinciding with the northward and southward movement of the rains. This is perhaps surprising in view of the fact that only eight species in Appendix 2 are clearly passage migrants (Category F). It seems, therefore, that many more species engage in less obvious passage through Mole, obscured by their abundant resident populations.

These results can be compared directly with those obtained by regular censuses at Fété Olé, Senegal, in the Sahel savanna zone (Morel & Morel 1974). There also, the numbers of Ethiopian species show two annual peaks, during the wet season, and in the early dry season. The wet season peak coincides with a period of low numbers at Mole, supporting the view that the peaks at Mole represent the passage of birds to and from the Sahel zone. The dry season peak at Fété Olé is due largely to a single species, Eremopterix leucotis, and may represent the movement of birds from the more arid savannas to the north. The magnitude of the seasonal fluctuations at Fété Olé is greater than at Mole (twice the minimum number of birds, compared to 1.6 times). This difference is probably attributable to the greater severity of the dry season in the Sahel zone, allowing relatively fewer birds to remain throughout the year.

The number of species recorded also shows greater variation than at Mole (15 to 33 species each month, compared to a range which is actually less than the 76 to 99 species indicated by Figure 3), involving a much greater proportion of the avifauna. This difference may be a result of the fact that the Guinea zone exchanges many species with the zones both to north and to south (apparently in such a way

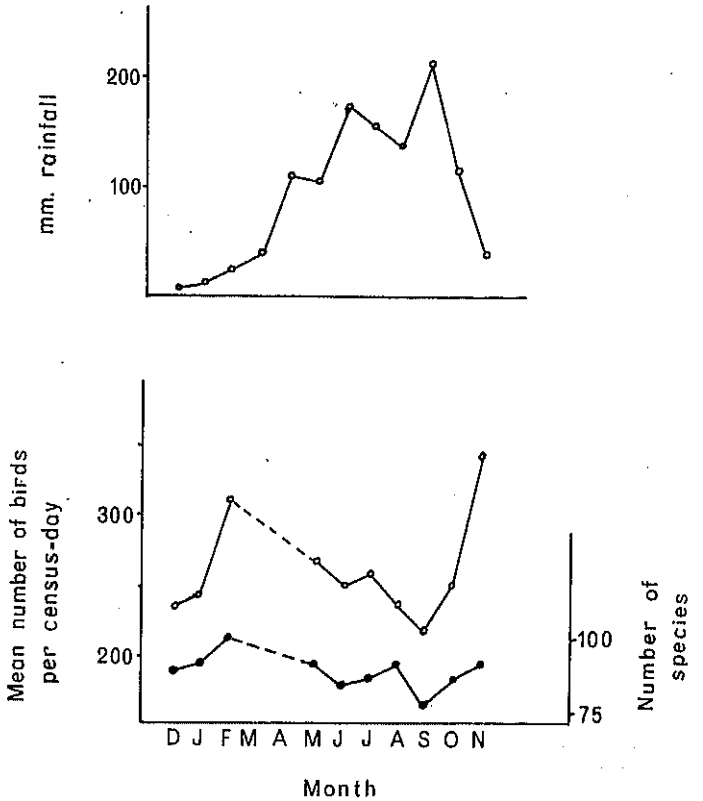

Figure 3. Seasonal variation in rainfall and abundance of birds at Mole National Park

(a) 10-year average monthly rainfall at Damongo; data from Maze (1970)

(b) Mean number of birds recorded per census-day (open circles), and total number of species recorded per month (shaded circles). Dashed lines indicate the presumed trend in the absence of censuses.

that the total species number is kept more or less constant), whereas the Sahel zone loses species to the south in the dry season which are not replaced by comparable numbers of species from the north. The seasonal stability of the number of species at Mole was confirmed by more intensive observations than the censuses, showing that although the total species-list for the park is 314, no more than about 200 species have been recorded in any two-month period (Greig-Smith 1976).

This discussion has taken no account of the timing of breeding, which is highly relevant to an understanding of migration patterns. It is hoped that when a longer series of census-results are available, breeding will be taken into account, as well as year-to-year differences in patterns of abundance.

Acknowledgements

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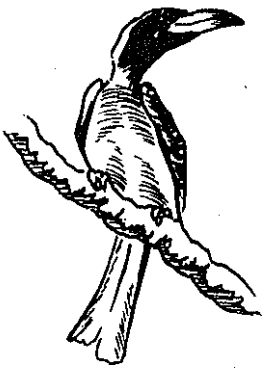
APPENDIX 1

Palaearctic species, in addition to those listed in Figure 1, which have been recorded at Mole National Park. Species in parenthesis have Palaearctic and Ethiopian races which are easily confused.

		Month seen
White Stork	Ciconia ciconia	?
Short-Toed Eagle	Circaetus gallicus	March
(Black Kite	Milvus migrans	Sept - April)
Lesser Kestrel	Falco naumanni	Jan
Kestrel	Falco tinnunculus	Oct - Dec
Grey Plover	Pluvialis squatorola	April
Whimbrel	Numenius phaeopus	Sept?
Green Sandpiper	Tringa ochropus	Dec - Jan
Redshank	Tringa totanus	Sept?
Great Snipe	Gallinago media	Oct
Black-Winged Stilt	Himantopus himantopus	?
(Hoopoe	Upupa epops	Dec, March)
Woodchat Shrike	Lanius senator	Dec, March
Whinchat	Saxicola rubetra	Dec, March
Redstart	Phoenicurus phoenicurus	Dec
Nightingale	Luscinia megarhynchos	March



APPENDIX 2

Migrant categories of Ethiopian species recorded in Mole National Park from December 1974 to November 1975. (Numerical data from which categorisations were made have been deposited with the Ghana Game and Wildlife Department).

A. Resident species

Neophron monachus, Terathopius ecaudatus, Francolinus bicalcaratus, Ptilopachus petrosus, Streptopelia semitorquata, S. senegalensis, Turtur afer + T. abyssinicus, Treron australis + T. waalia, Poicephalus senegalus, Psittacula krameri, Musophaga violacea, Crinifer piscator, Centropus senegalensis, Halcyon chelicuti, Merops bulocki, Phoeniculus purpureus, Lybius dubius, L. vieilloti, Pogoniulus chrysoconus, Campethera punctuligera, Mesopicos goertae, Nilaus afer, Dryoscopus gambensis, Tchagra senegala, Corvinella corvina, Dicrurus adsimilis, Coracina pectoralis, Pycnonotus barbatus, Turdoides plebejus, Eremomela pusilla, Sylvietta brachyura, Melaenornis edolioides, Bradornis pallidus, Batis senegalensis, Trochocerus longicauda, Parus leucomelas, Nectarinia senegalensis, N. pulchella, Serinus mozambicus, Plocepasser superciliosus, Vidua chalybeata, Estrilda caerulescens, E. bengala, Lonchura cucullata

B. Wholly migrant species, present in dry season

Pterocles quadricinctus, Coracias abyssinica, Oriolus auratus, Anthreptes platura, Emberiza tahapisi

C. Wholly migrant, present in wet season

Dendrocygna viduata, Eurystomus glaucurus

D. Partial migrant species, augmented in dry season

Scopus umbretta, Streptopelia vinacea, Tockus nasutus, Lamprotornis purpureus + chalybeus, Emberiza cabanisi, Passer griseus, Petronia dentata, Milvus migrans

E. Partial migrant species, augmented in wet season

Bostrychia hagedash, Numida meleagris, Mirafra rufocinnamomea, Prionops plumata, Laniarius barbarus, Malaconotus sulfureopectus, Campephaga phoenicea, Turdus pelios, Terpsiphone viridis, Nectarinia cuprea, Ploceus cucullatus Estrilda melpoda

F. Passage migrants

Ardeola ibis, Merops nubicus, Merops albicollis, Coracias naevia, C. cyanogaster, Cinnyricinclus leucogaster, Corvus albus, Buteo auguralis